PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P104426PCT/MPG	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/GB 03/04640	International filing date *(day/month/year)* 27.10.2003	Priority date *(day/month/year)* 29.10.2002
International Patent Classification (IPC) or both national classification and IPC G01R31/04, G01R31/00		
Applicant AEROFLEX INTERNATIONAL LTD et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 9 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 7 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☒ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
27.05.2004	13.05.2005
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Lopez-Carrasco, A Telephone No. +49 89 2399-7616

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB 03/04640

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-3, 5, 8-22	as originally filed
4, 6, 7	received on 18.03.2005 with letter of 16.03.2005

Claims, Numbers

12-18, 29-37	as originally filed
1-11, 19-28	received on 18.03.2005 with letter of 16.03.2005

Drawings, Sheets

1/7-7/7	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   - ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
   - ☐ the language of publication of the international application (under Rule 48.3(b)).
   - ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   - ☐ contained in the international application in written form.
   - ☐ filed together with the international application in computer readable form.
   - ☐ furnished subsequently to this Authority in written form.
   - ☐ furnished subsequently to this Authority in computer readable form.
   - ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
   - ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   - ☐ the description, pages:
   - ☐ the claims, Nos.:
   - ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees, the applicant has:

   ☐ restricted the claims.

   ☐ paid additional fees.

   ☐ paid additional fees under protest.

   ☐ neither restricted nor paid additional fees.

2. ☒ This Authority found that the requirement of unity of invention is not complied with and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

   ☐ complied with.

   ☐ not complied with for the following reasons:

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

   ☒ all parts.

   ☐ the parts relating to claims Nos. .

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	
	No:	Claims	19,28
Inventive step (IS)	Yes:	Claims	2,3,20,21
	No:	Claims	1,4-18,22-27,29-37
Industrial applicability (IA)	Yes:	Claims	1-28
	No:	Claims	

2. Citations and explanations

   see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1: US-A-5 365 180 (EDELMAN RAN) 15 November 1994 (1994-11-15)

D2: EP-A-0 622 733 (SGS THOMSON MICROELECTRONICS) 2 November 1994 (1994-11-02)

D3: ROBINSON C ED - INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS: "ANALOG AC HARMONIC METHOD FOR DETECTING SOLDER OPENS" PROCEEDINGS OF THE INTERNATIONAL TEST CONFERENCE. ITC '97. WASHINGTON, DC, NOV. 1 - 6, 1997, INTERNATIONAL TEST CONFERENCE, NEW YORK, NY : IEEE, US, vol. CONF. 28, 1 November 1997 (1997-11-01), pages 125-126, XP000800318 ISBN: 0-7803-4210-0

1.0 The amendments filed with the International Bureau under Article 19(1) introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 19(2) PCT. The amendments concerned are the following:
-"...device connections within a product..." on page 4, line 17, page 5, lines 12-13 ;
-"...connections in a circuit path within a product" on page 4 ,line 24 and claim 28;
-"...semiconductor device connections within a product containing one or more semiconductor devices..." in claims 1,19.

The description, page 1, lines 1-3 states that the present application relates to determining the integrity of a contact between an integrated circuit and a circuit board on which is mounted. Furthermore, page 4, line 4 states an object of the present application, namely, the detection of pin failures , in the presence of unknown series resistance in the test path. It is therefore not directly and unambiguously derivable from the application as filed that the tested connections are within a product containing one or more devices. .

2.0 Furthermore, the above-mentioned amendments going beyond the disclosure in the international application as filed, the subject-matter of claim 1 does not involve an inventive step in the sense of Article 33(3) PCT, and therefore the criteria of Article 33(1) PCT are not

met.

2.1 D1 discloses a method of testing the integrity of a plurality of semiconductor device connections (column 2, lines 5-10) where each semiconductor device includes a non-linear element in a conduction path (column 2, line 17) between a first node where a test signal is injected and a second node connected to a power supply connection of the devices, the method comprising the steps of :
-applying a test signal (column 2, line 16) to the devices such that a test current flows between said nodes creating a voltage difference between said nodes
-making measurements of the voltage difference (column 2, line 18) as the test current varies (column 2, lines 19-20), and
-on the basis of the measurements extracting a response component (column 2, lines 24-27) predominantly to the non-linear characteristic of the devices and using this to indicate whether the connection to the devices are acceptable.

Claim 1 differs from D1 in that:
-the semiconductor device connections are within a product containing one or more semiconductor devices.

However, D1 determines the dynamic resistance of a path, which includes the resistance of the two contacts, see column 2, lines 23-25. For the sake of determining contact resistance, it is immaterial whether the contacts are placed inside or outside of a device (product). The skilled person would then use the method and apparatus of D1 for determining the integrity of a contact within an integrated circuit without the use of an inventive step.
Therefore, claim 1 does not involve an inventive step.

3.0 Dependent claims 2,3,20,21 are not disclosed, nor hinted at, in the available prior art. However, the features of claims 2,20 are unclear, Art.6 PCT, as it is not evident to the skilled person how the offset voltage would be used to test the integrity of a plurality of semiconductor device connections.

4.0 Dependent claims 4,5 do not appear to contain any additional features which, in

combination with the features of any claim to which they refer, meet the requirements of the EPC with respect to inventive step, the reasons being as follows:

4.1 The features of claims 4,5 are seen as a matter of normal design procedure, see for example document D2, number 16 in Figure 3. Its inclusion in the method described in document D1 would therefore be an obvious design possibility for the skilled person.

5.0 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 10 does not involve an inventive step in the sense of Article 33(3) PCT.

5.1 D1 discloses a method of testing the continuity of a connection between an integrated circuit pin (the first pin of the device under test, column 2, line 16) and an electrical element where the integrated circuit pin forms a first group, the method comprising the steps of :
-identifying (column 2, line 16) a second group of integrated circuit pins (that second group being the second pin of the device under test) having electrical properties relatable to the first group;
-applying one or more test signals (column 2, line 16) to the first group of pins and measuring one or more respective first voltage differences (column 2, line 18) occurring between the first group of pins and a reference voltage; and
-on the basis of measurement extracting and comparing a non-linear characteristic (column 2, lines 25-27) of the first and second group of pins to obtain a measure of continuity.

Claim 10 differs from D1 in that:
-said electrical element is a circuit board;
-the integrated circuit pin is connected to a plurality of integrated circuit pins forming a first group.

The problem to be solved by the present invention may therefore be regarded as adapting a non-linear connection test method to testing integrated circuits already mounted on a circuit board.
The solution proposed in claim 10 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) for the following reasons:
The skilled person would adapt the method of described in document D1 to any number and type of connection pins, in particular the case of ICs mounted on PCBs is a conventional

application to testing connection integrity of contacts.
Therefore, claim 10 does not involve an inventive step.

6.0 Dependent claims 11-15,18 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the EPC with respect to inventive step, the reasons being as follows:

6.1 The features of claims 11-15,18 are seen as a matter of normal design procedure, see for example document D2, number 16 in Figure 3. Its inclusion in the method described in document D1 would therefore be an obvious design possibility for the skilled person.

7.0 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 19 is not new in the sense of Article 33(2) PCT.

7.1 D1 discloses an apparatus suitable for testing the integrity of a plurality of device connections where each device includes a non-linear element in a conduction path between a first node where a test signal is injected and a second node connected to a power supply connection of each device, the apparatus comprising:
-signal means (column 5, lines 17-18) for applying a test signal to the devices such that a test current flows between said nodes creating a voltage difference between said nodes,
a voltage measuring device (column 5, lines 19-25) for making measurements of the voltage difference as the test current varies, and
-a data processor (column 5, line 26- column 6, line 2) arranged on the basis of the measurements to extract a response component due predominantly to the non-linear characteristic of the devices and using this to indicate whether the connections to the devices are acceptable.

Therefore, claim 19 is not new.

8.0 Dependent claims 22,23 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the EPC with respect to inventive step, the reasons being as follows:

8.1 The features of claims 22,23 are seen as a matter of normal design procedure, see for example document D2, number 16 in Figure 3. Its inclusion in the method described in document D1 would therefore be an obvious design possibility for the skilled person.

9.0 The present application does not meet the requirements of Article 33(2) PCT, because the subject-matter of claim 28 is not new.

9.1 D1 discloses an apparatus suitable for testing the continuity of connections in a circuit path comprising a plurality of integrated circuit device pins forming a first group connected to a first circuit node such that current flows via the pins and through associated semiconductor junctions to a second circuit node, the apparatus comprising:
-first signal means (column 5, lines 17-18) suitable for applying M test signals to the first group of pins and measuring M voltage differences occurring between a second circuit node connected to the second group of pins and a reference, where N is an integer greater than zero; and
-a processor (column 5, line 26- column 6, line 2) responsive to the voltage differences for deriving of comparing a non-linear characteristic of the first and second groups of pins to obtain a measure of continuity.
Thus, claim 28 lacks novelty.

10.0 Dependent claims 6-9,16,17,24-27,29-32,34,35-37 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the EPC with respect to inventive step, the reasons being as follows:

10.1 The features of claims 29-32,35-37 are seen as a matter of normal design procedure, see for example document D2, number 21 in Fig.3. Its inclusion in the method described in document D1 would therefore be an obvious design possibility for the skilled person in order to solve the problem posed.

10.2 The features of claims 6-9,16,17,24-27,34 have already been employed for testing the integrity of a plurality of semiconductor device connections where non-linear elements are in the conduction path, see document D3. It would be obvious to the person skilled in the art, to

apply these features with corresponding effect to the method and apparatus according to document D1, thereby arriving at a method and apparatus according to claims 6-9,16,17,24-27,34.

****